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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/897,205	07/02/2001	Kevin R. Lensing	2000.071900	2053

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EXAMINER
KOYAMA, KUMIKO C

ART UNIT	PAPER NUMBER
2876	

DATE MAILED: 11/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/897,205	LENSING, KEVIN R.	
	Examiner	Art Unit	
	Kumiko C. Koyama	2876	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-80 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-80 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2&3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stirton (US 6,479,200) in view of Lensing (US 6,383,824).

Stirton discloses a method comprising forming a plurality of grating structures in a layer of photoresist, each of said formed grating structures being comprised of a plurality of photoresist features (col 12 lines 23-26). Stirton teaches that photoresist etching process may be performed to further reduce the size of the photoresist features (col 2 lines 57-59). Stirton also discloses a method comprising illuminating each of said formed grating structures (col 12 line 27), measuring light reflected off of each of said plurality of formed grating structures to generate an optical charcteristic trace for each of said plurality of formed grating structures (col 12 lines 28-32), and comparing each of said generated optical characteristic traces to at least one optical characteristic trace from the library of optical characteristic traces, each of which corresponds to a grating structure comprised of a plurality of photoresist features having a known profile (col 12 lines 33-35, lines 19-22).

Stirton fails to teach a method for stopping etching process based upon the comprison of at least one of the generated traces and the target traces.

Lensing discloses a method comprising stopping the deposition process based upon the comparison of the generated trace and the target trace (col 11 lines 14-15).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stirton and stop the etching process based upon the comparison of the generated traces and the target trace in order to observe only when changes are made by the etching process, which avoids unnecessary effort and expense.

Re claim 1 and 30: Stirton fail to teach a method comprising measuring light reflected off of each of said plurality of grating structures after the etching process is started to generate an optical characteristic trace for each of the plurality of grating structures.

However, Lensing discloses that the scatterometry tool 74 is used to measure or generate an optical characteristic trace of the process layer 34 after the deposition process has been started (col 4 lines 29-31).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stirton. It would have been obvious to measure light reflected off of each of the plurality of grating structures after the etching process is started to generate an optical characteristic trace for each of the plurality of grating structures in order to observe only when changes are made by the etching process, which avoids unnecessary effort and expense.

Re claim 16: Stirton fail to teach a method comprising measuring light reflected off of the grating structure during the etching process to generate an optical characteristic trace for the grating structure.

Lensing discloses that measurements may also be taken at different rates during the duration of the deposition process, i.e., more measurements may be taken as the process nears end point (col 7 lines 36-41).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stirton and measure light reflected off of the grating structure during the etching process to generate an optical characteristic trace for the grating structure in order to provide a more precise comparison and to obtain a product with a desired profile.

Re claim 45: Stirton fails to teach a method comprising forming a process layer above a semiconducting substrate, forming a layer of photoresist material above the process layer, and measuring light reflected off of the at least one grating structure after the etching process is started to generate an optical characteristic trace for the grating structure.

Lensing teaches the formation of many process layers or films of materials above a semiconducting substrate (col 4 lines 7-9), and a process of forming a layer of photoresist material above one or more process layers (col 1 lines 58-61). Lensing discloses that the scatterometry tool 74 is used to measure or generate an optical characteristic trace of the process layer 34 after the deposition process has been started (col 4 lines 29-31).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stirton. It would have been obvious to an artisan of ordinary skill in the art to form a process layer above a semiconducting substrate and form a layer of photoresist material above the process layer in order fabricate integrated circuit devices and other electronic devices. It would have been

obvious to an artisan of ordinary skill in the art to measure light reflected off of the at least one grating structure after the etching process is started to generate an optical characteristic trace for the grating structure in order to observe only when changes are made by the etching process, which avoids unnecessary effort and expense.

Re claim 63: Stirton further teaches that a plurality of photoresist features 38A will define a grating structure 60 (col 6 lines 15-16).

Stirton fail to teach a method comprising measuring light reflected off of each of said grating structures after the etching process is started to generate an optical characteristic trace for each illuminated grating structures.

However, Lensing discloses that the scatterometry tool 74 is used to measure or generate an optical characteristic trace of the process layer 34 after the deposition process has been started (col 4 lines 29-31).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stirton. It would have been obvious to measure light reflected off of grating structures after the etching process is started to generate an optical characteristic trace for each of the illuminated grating structures in order to observe only when changes are made by the etching process, which avoids unnecessary effort and expense.

Re claim 2, 17, 31, 49 and 67: Stirton fails to teach forming a plurality of grating structures in a layer of photoresist material above a scribe line of a wafer.

Lensing teaches forming at least one grating structure above a scribe line of a substrate 9col 10 lines 3-5).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stirton in order to provide an electronic device designed to function as desired.

Re claim 3, 18, 32, 50 and 68: Stirton teaches that the grating structures 60 may be formed above the area occupied by the production die formed on the wafer (col 6 lines 36-28).

Re claim 4, 19, 33, 51 and 69: Stirton teaches that the grating structures occupies an area of approximately 100 um X 120 um (col 6 lines 38-39).

Re claim 12, 26, 41, 59 and 77: Stirton teaches to drive DICD dimension 42 of the photoresist features 38A to a desired target value that will be useful in producing gate electrode structures 32A having the desired critical dimention 44 after etching (col 6 lines 5-9).

Re claim 13, 27, 42, 60 and 78: Stirton teaches that the profile traces generated by the scatterometry tool 74 may be based upon a comparison of light intensity to wavelength or a comparison of intensity of incident angle (col 7 lines 17-21).

Re claim 14, 28, 43, 61 and 79: Stirton fails to teach that comprising the generated optical characteristic trace to a target optical characteristic trace that corresponds to a grating structure comprised of a plurality of photoresist features having a desired profile comprises stopping the etching process when the generated trace and the target trace match.

Lensing teaches that scatterometry techniques may be used to stop or endpoint the desposition process used to form the process layer 34 such that the profile of the surface 36 matches or closely approximates the target optical characteristic trace (col 5 lines 51-57).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stiron and stop

the etching process when the generated trace and the target trace match in order to provide a reliable product at the same avoid unnecessary expense.

Re claim 46 and 64: Stirton teaches that the process layer 32 may be comprised of a layer of polysilicon (col 5 lines 29-30).

Re claim 47, 48, 65 and 66: Stirton teaches that the layer of photoresist 38 may be comprised of either positive or negative type photoresist material (col 5 lines 39-40).

Re claim 55, 56, 73 and 74: Stirton fails to teach that measuring light reflected off of said grating structure after the etching process is started to generate an optical characteristic trace for the grating structure comprises measuring light reflected off of the grating structure during the etching process to generate an optical characteristic trace for the grating structure.

Lensing discloses that measurements may also be taken at different rates during the duration of the deposition process, i.e., more measurements may be taken as the process nears end point (col 7 lines 36-41).

Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to integrate the teachings of Lensing to the teachings of Stirton and measure light reflected off of the grating structure during the etching process to generate an optical characteristic trace for the grating structure in order to provide a more precise comparison and to obtain a product with a desired profile.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Miller et al., U.S. Patent No. 6,259,521, discloses a method and apparatus for controlling photolithography parameters based on photoresist images.

Sawatari et al., U.S. Patent No. 5,923,423, discloses a heterodyne scatterometer for detecting and analyzing wafer surface defects.

Stover et al., U.S. Patent No. 5,955,654, discloses a calibration standard for microroughness measuring instruments.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kumiko C. Koyama whose telephone number is 703-305-5425. The examiner can normally be reached on Monday-Friday 7am-3:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael G. Lee can be reached on 703-305-3503. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

kck
November 14, 2002

MICHAEL G. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800